

Knowledge and attitudes of family physicians towards coronavirus disease 2019 infection burden: A cross-sectional study

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ABSTRACT

Objectives: Investigate the knowledge and attitudes of family physicians towards coronavirus disease (COVID-19). **Methods:** Data were collected from family medicine residents at King Fahd Medical City in Riyadh, Saudi Arabia, using an online questionnaire that assessed demographics, knowledge about COVID-19, and attitudes towards the disease. Data were analyzed using Stata software version 14. **Results:** A total of 179 participants (median age: 28 years) responded; 94 (52.5%) were female. Average knowledge score on a scale of 0–10 was 8.64 ± 0.97 . Knowledge scores were similar between males and females (mean deviation [MD] = -0.14 , $p = 0.3$). Fourth-year residents had higher knowledge scores compared to those in their first (MD = 1.2 , $p < .001$), second (MD = 0.82 , $p = 0.001$), or third (MD = 0.69 , $p = 0.02$) years. Mean attitude score on a scale of 0–18 was 15.6 ± 1.3 . Females exhibited slightly higher positive attitude scores (MD = 0.44 , $p = 0.02$). **Conclusion:** Residents demonstrated high knowledge and positive attitudes towards COVID-19. More experienced physicians exhibited higher knowledge scores; attitude scores were independent of experience.

Keywords: COVID-19, family physicians, knowledge, attitudes

1. INTRODUCTION

In December 2019, seafood consumption was associated with the development of pneumonia of unknown origin in a large cohort of patients in Wuhan, China. Sequencing of patient sputum samples led to the discovery of a novel beta coronavirus (Ciotti et al., 2020; Loder, 2020). The beta coronavirus could also be isolated from airway epithelial cells in infected humans. This virus was structurally different from other members of the coronavirus family that infect humans (Gupta et al., 2019; Rothan and Byrareddy, 2020), including the Middle East Respiratory Syndrome-coronavirus (MERS-CoV) and the Severe Acute Respiratory Syndrome-coronavirus (SARS-CoV). The organism that



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causes the new infection was named the SARS-coronavirus type 2 (SARS-CoV-2; Ministry of Health, Kingdom of Saudi Arabia [MOH-KSA], 2020a). The infection caused by SARS-CoV-2 has gained global attention for being one of the most highly contagious coronaviruses capable of infecting humans and causing associated complications and death. Research efforts have been ongoing all over the world to unravel the mysteries surrounding this organism (Zhu et al., 2020).

The SARS-CoV-2 virus can be transmitted from one person to another via respiratory droplets that are dispersed through coughing, sneezing, or talking (Guo et al., 2020; Lotfi et al., 2020). The main transmission method is direct contact with infected individuals or contaminated surfaces and objects (Liu et al., 2020). Data obtained from multiple clinical and virological studies have shown that the highest shedding rates of the virus are in the oropharynx and trachea, especially in the nose and throat (Lauer et al., 2020; Liu et al., 2020; Wang et al., 2020). The virulence of this virus is higher in the first three days following the appearance of symptoms (Lauer et al., 2020; Liu et al., 2020; Wang et al., 2020). Moreover, studies have shown that patients infected with SARS-CoV-2 were more infectious directly after contracting it, compared to later stages of the disease.

The COVID-19 infection has spread rapidly and has caused many fatalities in nearly all regions of the world. The World Health Organization (WHO; 2020a) declared the infection a pandemic when it had caused the death of 100,000 patients in more than 100 countries. The WHO (2020b) reported that the estimated global fatality rate of COVID-19 was 6% in June 2020. Additionally, the Centers for Disease Control (CDC; 2020a) have stated that COVID-19 is a preventable rather than a treatable condition.

According to the CDC (2020b), the most vital measures of prophylaxis against COVID-19 are avoiding crowded places and maintaining social distancing. Saudi Arabia has introduced massive awareness campaigns related to COVID-19 via online pages, websites, and media and press journals (MOH-KSA, 2020a, 2020c). An updated follow-up portal for infection and recovery rates can be obtained through the official website of the MOH in Riyadh and Makkah (MOH-KSA, 2020b). Although research articles on the virus and disease are being published globally, information regarding the knowledge and attitudes of family physicians in Saudi Arabia towards the burden of the coronavirus disease has not yet been published. Therefore, we conducted this cross-sectional study in Riyadh to investigate family physicians' knowledge levels and determinants of attitudes towards the COVID-19 infection.

2. MATERIAL AND METHODS

This was an institution-based cross-sectional study conducted at the King Fahad Medical City hospitals in Riyadh, Saudi Arabia, between May and August 2020. This research was reviewed by the Research Center Committee and the Institutional Review Board at the King Fahad Medical City. Before enrollment, we explained the objective of the study, clarified that participation was voluntary, asserted that data would be kept anonymous and confidential, and stated that voluntary withdrawal was possible at any time without any consequence on participants' present or future work. The informed consent form appeared on the first page of the survey. If the participant proceeded to complete the survey, that indicated informed consent.

Data were collected from family physician residents using an online survey created by Google Forms that was sent to potential participants via email. The questions were developed by study investigators and reviewed by an expert for content validity. Additionally, the survey was directed and modified according to respondents' feedback. It consisted of three main parts: A) questions collecting demographic information including age, gender, level of residency, and years of experience; B) participants' level of knowledge about COVID-19 assessed with 10 yes-no questions; and C) participants' attitudes towards the disease assessed with 6 questions measured on a Likert scale from 1–3 representing the following answers: *agree*, *disagree*, and *I don't know*. We calculated our sample size from a total population of 500 family physician residents. The Raosoft sample size calculator was used to find that a minimum of 218 participants were needed to achieve significance in this study, given that the margin of error α = 0.05, the confidence interval = 95%, the total population = 179, and the distribution response = 50%.

Data were analyzed using Stata version 14 for Windows. Prior to analysis, the collected data were cleaned and screened for mistakes, missing answers, and outliers. All collected data were summarized using descriptive statistics. Nominal and ordinal data were reported as frequencies and percentages. Numerical data were first examined for distribution, and then reported as mean and standard deviation (if they were normally distributed) or as median and range (if they were not normally distributed). All hypotheses were tested with two-sided tests, and p -values ≤ 0.05 were considered significant. To assess the knowledge scale, wrong answers were given a score of 0 and correct answers were given a score of 1, meaning that an overall score of 0 was the minimum and 10 was the maximum. The scores were then grouped into three categories (less than 50% of the attainable score, 50%–75% of the attainable score, and more than 75% of the attainable score) to describe the frequency of participants in each group. Finally, the knowledge scores were compared with demographic variables using either the t -test or the analysis of variance (ANOVA) test.

To assess the attitude scale, negative attitude answers were given a score of 1, uncertain answers were given a score of 2, and positive answers were given a score of 3. Higher the total scores, the more positive the attitude. The scores were then grouped into

three categories (less than 50% of the attainable score, 50%–75% of the attainable score, and more than 75% of the attainable score) to describe the frequency of participants in each group. Attitude scores were then compared with the demographic variables using either the *t*-test or the ANOVA test.

3. RESULTS

Our survey included responses from 179 family medicine residents. Participant ages ranged from 25 to 40 years, with an average of 28 years. Most physicians (41%) were in their second year of family medicine residency, and approximately 68% reported having 5–10 years of experience. Baseline characteristics of our included physicians are shown in Table 1. In terms of knowledge, 116 participants (64.8%) thought that SARS-CoV-2 could not be transmitted from animals to humans, 177 (98.9%) thought that it could be transmitted between humans, and 169 (94.4%) thought that it could be transmitted through droplets. One-hundred and forty participants (78.2%) thought that SARS-CoV-2 was preventable, and 165 participants (92.2%) knew that no current vaccine was available. One-hundred and seventy-two participants (96%) thought that the COVID-19 infection could cause serious complications, and all the respondents (100%) knew that people with immune deficiencies and debilitating diseases were more likely to experience serious complications. Having traveled outside the country within 14 days prior to the onset of symptoms was said to suggest a COVID-19 diagnosis by 86% of our sample. In addition, 92.7% knew that contact with a confirmed COVID-19 case 14 days prior to the onset of symptoms was one of the diagnostic criteria of COVID-19 pneumonia.

Table 1 Demographics and baseline characteristics of survey respondents.

Demographic	<i>N</i> (%) or Median (range)
<i>N</i>	179
Age	28 (25–40)
Gender	
Male	85 (47.5%)
Female	94 (52.5%)
Level of residency	
R1	46 (25.7%)
R2	73 (40.8%)
R3	35 (19.5%)
R4	25 (14%)
Years of experience	
< 5 years	55 (30.7%)
5–10 years	121 (67.6%)
> 10 years	3 (1.7%)

Approximately 50% of the survey participants reported that the whole set of manifestations (headache, sore throat, cough, fever, runny nose, shortness of breath, abdominal pain, diarrhea, hemoptysis, fatigue, myalgia, nausea, and vomiting) could be potential COVID-19 symptoms. However, the most common expected symptoms were headache, sore throat, cough, fatigue, and shortness of breath. More than 60% of participants reported that the SARS-CoV-2 infection could be complicated with pneumonia, kidney failure, severe acute respiratory distress, or death. The most common expected complications were pneumonia and severe acute respiratory distress. A summary of the knowledge answers is displayed in Figure 1.

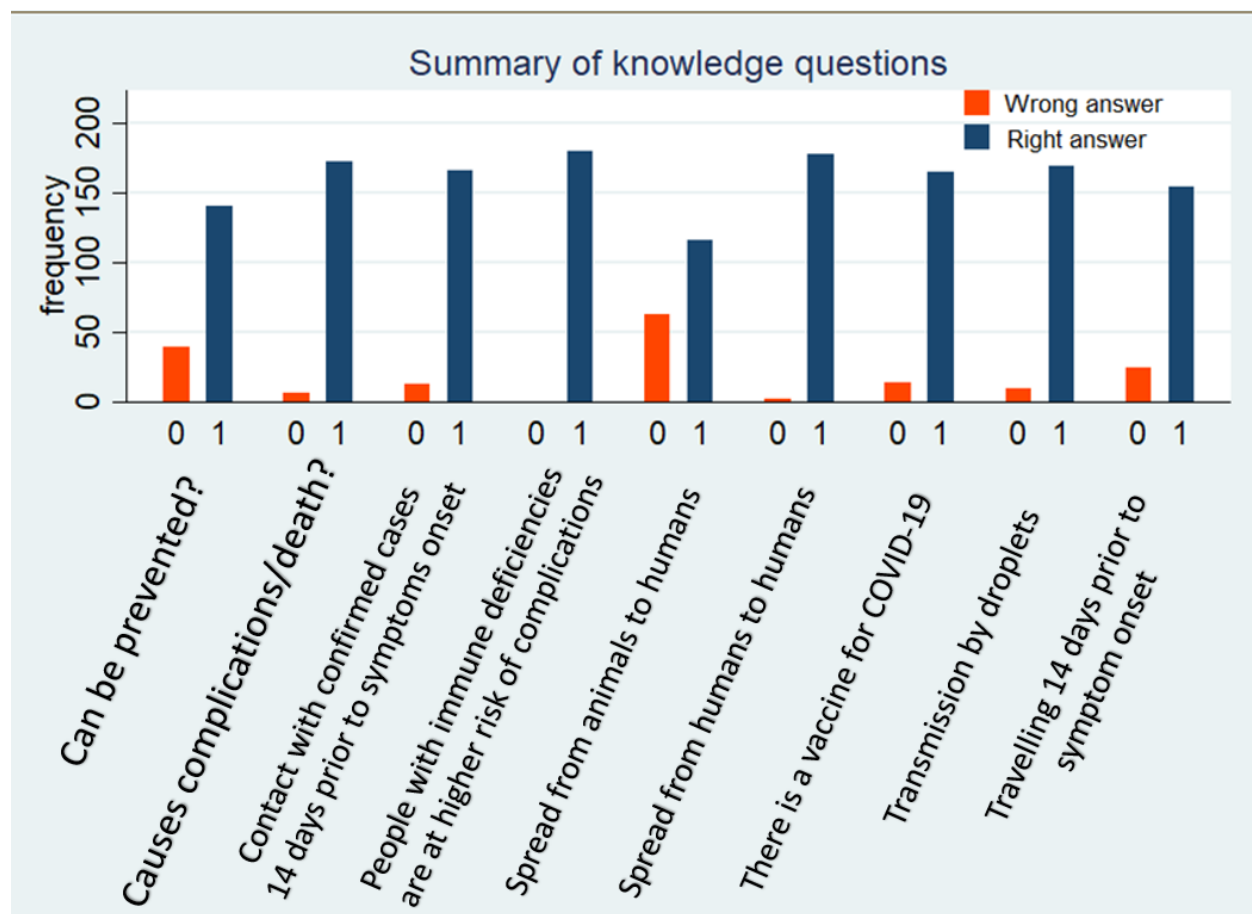
The average knowledge score among respondents was 8.64 ± 0.97 . Over 82% of the participants had a knowledge score ≥ 7.5 out of 10 (Table 2). No significant difference in knowledge scores was detected between male and female residents (mean deviation [MD] = -0.14, $p = .3$). ANOVA analysis showed a significant difference between residents in their fourth year of residency compared to those in their first year ($MD = 1.2$, $p < .001$), second year ($MD = 0.82$, $p = .001$), and third year ($MD = 0.69$, $p = .02$). In addition, participants with 5–10 years of experience had significantly higher mean knowledge scores compared to those with <5 years of experience ($MD = 0.65$, $p < .001$).

Table 2 Summary of knowledge and attitude data.

Variable	Mean
Knowledge score (max = 10)	8.6 ± 0.97
Knowledge score category	
< 5	0 (0%)
5–7.5	32 (17.9%)
7.5–10	147 (82.1%)
Attitude score (max = 18)	15.6 ± 1.3
Attitude score category	
< 9	0 (0%)
12–15	0 (0%)
15–18	179 (100%)

In terms of attitudes, all participants (100%) suggested that hand hygiene could help in the prevention of COVID-19, 75% believed that surgical masks were enough to prevent transmission of infection during patient contact, and 60% thought that N95 masks were better than surgical masks for infection prevention. Approximately 25% of participants indicated that people should be worried about any cold-like symptoms, whereas 56% of participants completely disagreed with this perspective. A full 99% of participants thought that COVID-19 is a serious problem, and 100% agreed that they needed to spread awareness among patients as a family physician. A summary of the attitude answers is depicted in Figure 2.

The mean attitude score among survey participants was 15.6 ± 1.3 . All participants showed an attitude score ≥ 15 out of 18. A slightly higher attitude score was seen in female physicians compared to male physicians ($MD = 0.44$, $p = .02$) and among second year residents compared to first year residents ($MD = 0.73$, $p = .015$).

**Figure 1** Knowledge questions and answers.

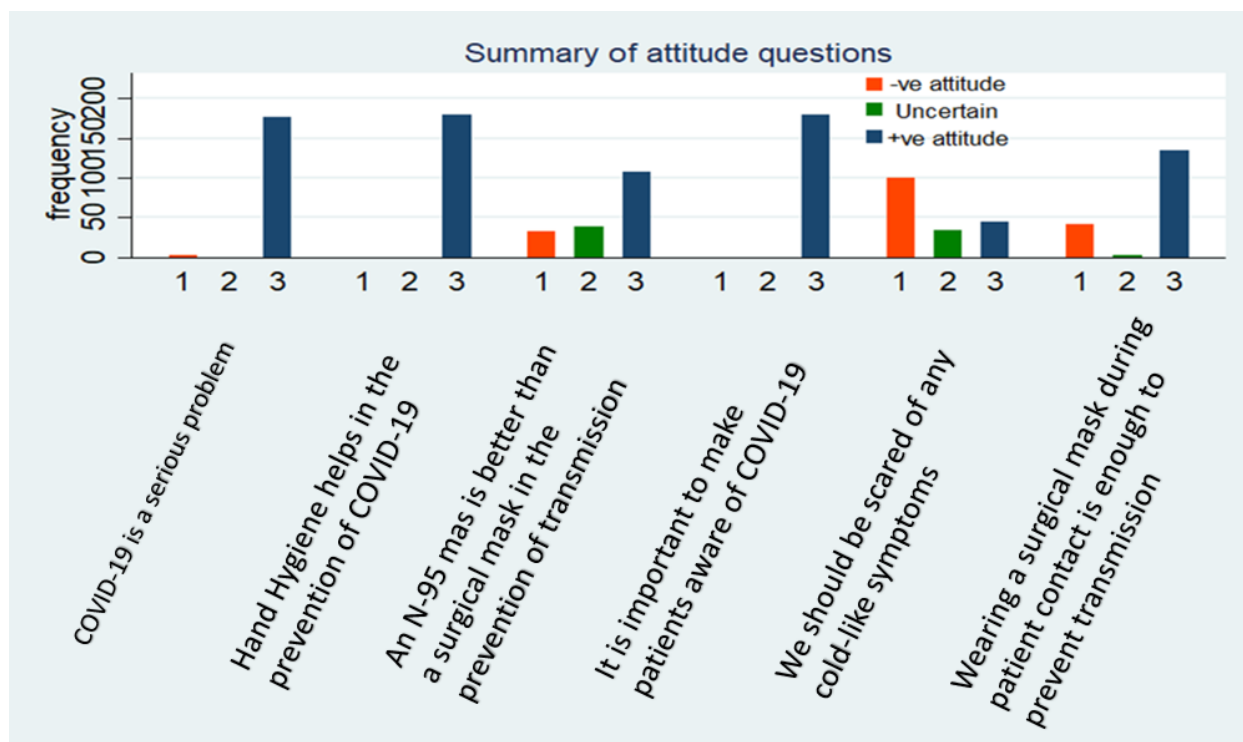


Figure 2 Attitude questions and answers.

4. DISCUSSION

This cross-sectional study included 179 family medicine residents practicing in Riyadh, Saudi Arabia. Of those participants, 52.5% were female, 40.8% were in their second year of residency, and 67.6% had 5–10 years of medical experience. Most of the family physicians included in this study had considerable knowledge concerning the COVID-19 infection (82.1%). No significant difference was found in knowledge scores based on gender. However, knowledge scores increased based on residential year and level of medical experience. The results of our study augment the results of previously published articles that demonstrate that health-care workers (HCWs) have acceptable degrees of knowledge and positive attitudes concerning the COVID-19 infection. Numerous past studies have investigated the knowledge and attitudes of HCWs towards the COVID-19 infection (Khader et al., 2020; Nemati et al., 2020; Quadri et al., 2020; Shi et al., 2020). Quadri et al., (2020) utilized a nationwide survey that assessed COVID-19 awareness levels among 706 dental practitioners in Saudi Arabia. Interestingly, the level of knowledge related to the disease was associated with the qualification level of dental practitioners. In contrast, there was no difference in the selection of knowledge sources about COVID-19.

Khader et al., (2020) evaluated the perceptions, attitudes, and awareness of dentists in Jordan concerning the COVID-19 infection. The majority of study participants had a solid awareness of COVID-19 infection symptoms and knew how to identify patients at risk for COVID-19. Additionally, most dentists were familiar with how COVID-19 could be transmitted, and they knew how to decrease transmission risks inside their dental clinics. Forty-four percent of study participants already knew that the incubation period of COVID-19 is 7–14 days. Additionally, 74.7% of participants realized the importance of asking their patients to wear masks in the waiting room, keep an appropriate distance from other patients, and wash their hands before sitting in the dental chair. These measures were essential for reducing the COVID-19 spread.

A knowledge, attitudes, and practices (KAP) study was performed in two Chinese mental health centers during the initial surge of the COVID-19 infection (Shi et al., 2020). The study found that 89.51% of the staff had a knowledge percentage of 90%. Moreover, level of education was reported to be associated with better KAP measures. A study by Ahmed et al., (2020) assessed the fear and anxiety of dentists associated with the risk of contracting the SARS-CoV-2 virus. In their study, 78% of dental practitioners were scared and anxious about the dreadful effects of the COVID-19 pandemic. Despite 90% of respondents following up with the successive changes in COVID-19 treatment protocols, only 61% had implemented the current version of treatment protocols. Even though the dentists in Ahmed et al.'s (2020) study had high levels of knowledge and were well trained, they were in a state of fear and anxiety in their practices.

Nour et al., (2015) conducted a study in Saudi Arabia to assess the KAP of HCWs concerning MERS-CoV. Their study showed that one-third of the participants had a good amount of knowledge relative to the MERS-CoV infection, with an average knowledge score of 18.3 out of 28 points. In regard to attitude, 91.8% of these HCWs exhibited a negative attitude towards the MERS-CoV infection, with a mean attitude score of 5.4 out of 11 points. A study by Alnakli (2016) measured Saudi Arabians' health beliefs about the MERS-CoV virus. Participants reported solid knowledge and a positive attitude towards the MERS-CoV infection. Interestingly, the KAP of the study subjects varied significantly based on their geographical distribution. An additional community-based study demonstrated that female citizens in Saudi Arabia had higher COVID-19 awareness levels than did male citizens (Al-Hanawi et al., 2020).

The results of our study are similar to many previous cross-sectional studies (Ahmed et al., 2020; Al Sulais et al., 2020; Khader et al., 2020; Nemati et al., 2020; Quadri et al., 2020). When comparing the overall knowledge of our study participants to the knowledge of participants in similar published studies, our participants' knowledge scores were generally higher. For example, Alzoubi et al., (2020) assessed the KAP of Jordanian university students. A total of 99.7% of students in their study thought that hand washing was essential to combat COVID-19, compared to 100% of participants in our study. Those students also reported a knowledge score of 75% when asked whether masks could prevent COVID-19, compared to the 100% knowledge score of participants in our study.

In our cross-sectional study, all residents had positive attitudes towards the precautions needed to deal with patients in the era of the COVID-19 pandemic. We found no significant difference in attitude scores based on years of medical experience. Attitude scores were higher in females and second-year residents compared to males and first-year residents. To our knowledge, this cross-sectional study is the first to investigate the knowledge and attitudes of family medicine residents in Saudi Arabia. We used sophisticated analysis methods to assess the roles of gender, residential year, and level of medical experience on the knowledge of and attitudes towards the COVID-19 infection. Some limitations of the study include the relatively small sample size and the single location setting. Future studies conducted on a larger scale covering a broader geographical location are encouraged.

5. CONCLUSION

Our cross-sectional study showed that residents of family medicine had high levels of knowledge of the COVID-19 infection and positive attitudes towards precautionary measures. The knowledge level was proportional to participants' residency year and level of medical experience. Females and second-year residents had more positive attitudes towards COVID-19 compared to males and first-year residents.

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Author Contributions

Dr. Alotibi devised the study and participated in writing the paper. Dr. Ola Alqudah distributed the questionnaire, collected the data, and participated in writing the paper. Dr. Safa Alqudah supervised the study, conducted the analysis, and helped to finalize the paper.

Ethical approval

This research was reviewed by the Research Center Committee and the Institutional Review Board at the King Fahad Medical City (IRB approval number: IRB00010471, ethical committee approval number: FWA00018774).

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Conflict of interest

The authors declare no conflict of interest.

Data and materials availability

All data associated with this study are present in the paper.

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